oceanic circulation to difference of specific gravity, due to difference of temperature or amount of salinity; but, though this is a *vera causa* which might in some cases explain similar phenomena, Sir Charles shows, by reference to the observations of Captain Spratt and others, that the currents of the Mediterranean, and, indeed, all observed currents, are due to other causes.

The question of the dependence of climate, both subaerial and sub-aqueous, upon geographical conditions, is very important in its bearing upon the changes in the inorganic world. For those who believe that in the history of the crust of the earth we have evidence of alternate periods of universal catastrophic action and repose would be quite prepared to believe that in the world of life also there were alternations of destruction and creation; but to those who hold that the face of the globe has been, and is for ever being, modified by the gradual action of forces always in operation, it seems *à priori* probable that Nature should have provided the organisms which inhabit this ever-shifting earth with modifiability somewhat commensurate with the changes of the world in which they live.

A mountain has been raised and chiselled out into its present form by operations extending over a period so vast that no one can have witnessed them. A species has been changed into something quite different by processes requiring a length of time so great that no one can have watched them.

Whatever may have been the chief *causes* of the movements of upheaval, it is a *fact* that movements are going on which bring different parts of the crust within reach of denudation, and that, given sufficient time, mountain ranges must be the result.

So, whatever may be the *origin* of the variations, it is a thing definitely known that variations of the same kind as those which are considered to form specific differences do occur; it is a matter of experiment that these variations can be accumulated and perpetuated by selection; it is a matter of observation that Nature does select. The burden of proof that there are any limits to variation or natural selection rests with those who hold it.

It has been objected to the doctrine of the origin of species by natural selection that some totally distinct classes of animals have corresponding organs, so similar that it is difficult to suppose that they can "'have been brought about in two independent instances by merely indefinite and minute accidental variations.' Yet these organs in the two types must have been developed in entire and complete independence one of the other; for it would be impossible to find a common ancestor without going back to some very simple form not yet provided with even the rudiments of vision" (p. 498).

Sir Charles quotes Mr. Darwin and others to prove that in some at least of the cases adduced the similarity of structure was exaggerated. Still it is undoubtedly very great, and the study of such cases and of the mimetic forms which Mr. Wallace has so well described, makes us feel that what we chiefly want to know more about, is the law which governs the first appearance of varieties. Such facts do not so much furnish arguments against the doctrine of the origin of species by natural selection, as in favour of the existence of some law according to which external conditions and the requirements of the individuals may tend to produce variation in a given direction.

How vast and how perplexing are the questions raised by the study of the modern changes of the earth and its inhabitants; but the calm philosophic spirit which pervades the "Principles of Geology" leads us to hope that it may promote in no small degree that education which will render it "possible to welcome new truths," although they may at first appear to be "out of harmony with cherished associations of thought."

T. McK. HUGHES

NOTES

WE are informed that the Directorship of the National Observatory at Marseilles has been offered to Dr. Janssen.

25,000 rupees have already been subscribed towards the Archdeacon Pratt Memorial Fund.

WE are glad to hear that the local committee at Brighton are forming a temporary museum, to be opened during the Meeting of the British Association.

THE prizes in the Faculties of Art, Science, and Fine Arts, of University College, London, were distributed by the Right Hon. S. Cave, M.P., in the Botanical Theatre of that institution on Tuesday last. The attendance was very small, and several even of the professors absented themselves; but, notwithstanding this bad management on the part of the authorities, the proceedings were exceedingly animated and highly interesting to those engaged in the advancement of education. The report of the Dean, Prof. Croom Robertson, showed a very marked improvement in the condition of the College as well as of the School, the number of students during the past session having been greater than in any previous year. Amongst those who distinguished themselves the most notable were four ladies: Miss Orme, who was presented with the first prize and the first certificate for Political Economy, the only class in the Faculty of Arts which has as yet been opened to ladies; Miss Lupton, Miss Malden, and Miss Wylde, who received medals in the Fine Arts Faculty. The third certificate in this class was also taken by a lady; the number in the class being about thirty gentlemen and six ladies. The genuine and enthusiastic applause of the students at these successes leaves nothing to be wished for, except the continuation of that liberal policy for which University College has always been remarkable. Miss Orme had previously greatly distinguished herself at the examinations of the University of London.

THE following telegram has been received at the Admiralty from Aden, dated June 17:—"Dawson and party have returned to Zanzibar, Mr. Stanley having arrived with despatches from Livingstone: alive and well." Letters of that date from Aden are now due.

BESIDES the Minor Scholarships or Exhibitions at St. John's College, Cambridge, there will be offered for competition this year an Exhibition of 50*l.* per annum for proficiency in Natural Science, the Exhibition to be tenable for three years in case the Exhibitioner have passed within two years the previous Examination as required for candidates for honours; otherwise the Exhibition to cease at the end of two years. The Examination will commence on Friday, the 13th of December; in (1) Chemistry, including practical work in the laboratory; (2) Physics, viz., Electricity, Heat, Light; (3) Physiology; they will also have the opportunity of being examined in one or more of the following subjects: (4) Geology, (5) Anatomy, (6) Botany, provided that they give notice of the subjects in which they wish to be examined four weeks prior to the Examination. No candidate will be examined in more than three of these six subjects, whereof one at least must be chosen from the former group. It is the wish of the master and seniors that excellence in some single department should be specially regarded by the candidates. They may also, if they think fit, offer themselves for examination in any of the Classical or Mathematical subjects. Candidates must send their names to one of the tutors, Dr. Parkinson, Mr. Bonney, or Mr. Sandys, before the commencement of the Examination. The Minor Scholarships are open to all persons under twenty years of age, whether students in the University or not, who have not yet commenced residence in the University or who are in the first term of their residence. A Minor Scholarship is tenable for two years, or until the scholar is elected to one of the Foundation Scholarships. The Exhibitions are not limited in respect to the age of candidates. It is understood that minor scholars or exhibitioners may be candidates for Sizarships.

THE announcement last week that Mr. E. R. Lankester had gained a Natural Science Scholarship at Exeter College, Oxford, should have read "Fellowship."

THE East London Museum at Bethnal Green was formally opened by the Prince and Princess of Wales on Monday last.

THE Devonshire Association for the Advancement of Literature, Science, and Art, will shortly hold its annual meeting at Exeter, under the presidency of the Bishop of the Diocese.

PROF. HUMPHRY gave his second lecture on "Human Myology" at the College of Surgeons on Wednesday, the 19th. In it he traced the elements of the lateral muscle upon the limbs, forming muscular expansions over them which, he said, were most clearly marked in the rudimentary claw-like limbs of some snakes, but sufficiently distinct in ourselves. In the upper limb, for instance, they form a superficial ventro-appendicular cone, which is divided, sectorially, into the pectoralis, the latissimus dorsi, and the trapezio-deltoid. In the lower limb the corresponding sheet is divided into the gracilis, the gluteus magnus, and the sartorius, with the tensor vaginæ femoris. The deeper layers of the ventro-appendicular cones more closely invest the shoulder and hip-joints. That in the upper limb he divided into the infra-spinatus and teres minor, the coraco-brachialis and subscapularis, and the supra-spinatus; and that in the lower limb he divided into the gluteus medius and minimus, the adductors and obturator, the iliacus and the pyriformis. The professor remarked that the developmental processes are so freely modified in accordance with the special requirements of each limb that an exact homological comparison of the muscles is out of the question; and he showed that the difference in the direction of the rotation of the upper and of the lower limbs upon their respective girdles has been attended with considerable modification of the attachment, especially of the insertion of the several muscles. He spoke of the clavicle as an ossification in one of the intermuscular septa of the ventral muscle, and as, therefore, corresponding serially with the epicostal or "intermuscular" bones developed in the abdominal wall of some lizards. Poupart's ligament belongs to the same series, and spans the crural arch as the clavicle spans the brachial arch. Various points in the disposition of the muscles of the upper parts of the limbs and the purposes served by them were discussed.

SIGNOR G. A. PASQUALE, in a paper presented to the "Accademia delle Scienze fisiche e matematiche" of Naples, attributes the injury done to vegetation by the recent eruption of Vesuvius neither to scorching nor to the mechanical action of the ashes in closing the pores of the leaves, the effect being much more sudden than if due to the latter cause; but to the injurious effects of the chloride of sodium which falls in considerable quantities with the ashes.

THE following account of the recent thunderstorm at Birmingham, by Mr. T. L. Plant, is taken from the *Gardener's Chronicle*:—"Birmingham and vicinity were visited on June 18 by a thunderstorm, accompanied by the most tremendous quantity of rain and enormous pieces of ice, ever registered within my records. The sudden heat after the low temperature in the early part of last week caused the air on the 17th and 18th to become highly surcharged with electricity. On Monday night the heat was intense, lowest thermometer 62°. The rapid increase of temperature will be understood by the following copy of my daily readings from the 12th:—

Highest Temperature in the Shade.

June 12	62°	June 17	86°
" 13	69°	" 18	88°
" 14	77°	(highest temperature recorded in June since 1858	
" 15	80°		
" 16	82°		

At 12.45 the storm commenced, and lasted three hours and a half. For fully half an hour the rolling thunder was incessant. The depositions of ice began about two o'clock, and during a period of 20 minutes to half an hour there was a fall of large frozen bodies, mingled with tremendous rain, to an extent that finds no parallel in these annals. Some of the pieces of ice (which were of most irregular formation) measured quite an inch in length. During the height of the storm the wind was high and calm in alternate succession, and changing to various points of the compass, and ultimately south, as at first. The fall of rain in this great tempest was 2·47 inches. This is the largest quantity that has been registered in Birmingham, even exceeding the great storm on the evening of July 6, 1845. Most of the rain (which is equal to 250 tons of water to the acre) fell in 45 minutes."

THE School of Science in connection with the Albert Memorial Museum at Exeter shows the zeal with which science is being cultivated in that city. The number of individual students under instruction during the current session has been 67, viz.:—7 in elementary mathematics, 13 in theoretical mechanics, 36 in inorganic chemistry, 9 in vegetable anatomy and physiology, 9 in systematic and economic botany, 7 in physical geography, 4 in machine construction and drawing, and 9 in building construction. The Museum has made considerable progress during the year.

WE have again to notice the increasing success of artizan students at the Oldham School of Science and Art, in practical Inorganic Chemistry; nineteen have passed out of twenty-one examined by the Department.

FROM the Report of the Free Libraries Committee of Birmingham for 1871, we are glad to see that, although the number of volumes in the library bearing on science is small, the demand for them shows considerable interest in these subjects among the frequenters of the library.

THE Committee of Trustees of the Industrial and Technological Museum of Victoria have issued their report for the year 1871. The progress of the Institution is spoken of as having been satisfactory, the number of visitors having greatly increased as well as of objects in the Museum. Illustrations of the mineralogical wealth of our colonies must always be of the highest importance, and there is now in the Museum a collection of the rocks of Victoria, classified and labelled, as well as a large series of fossils from different parts of the country which have not yet been classified. The models of mining machinery, formerly in the University Museum, are now also exhibited in this Museum, forming a most important and complete collection, which has excited great interest among the visitors. The exhibition of vegetable products, illustrative of their industrial uses, is rapidly increasing, and is now being systematically arranged, but is not yet catalogued. The collection of animal products, illustrative of their industrial uses, is very useful and complete. Courses of lectures have been delivered at the Museum, the primary object of which has been to make science in its relation to industry known among the artisan and mechanical classes, and the committee hope that this object has been in some measure attained.

Class lectures for practical instruction and laboratories have also been in operation.

THE circular of the University of Washington for the current year contains a catalogue of the officers and students, and a programme of the course of studies required in the different departments. In these the Physical and Natural Sciences hold a conspicuous place.

THE Deutscher Universitäts-Kalender, by Dr. F. Aschersen, published half-yearly, contains a mass of valuable information respecting all the German universities, including the names of the professors in the several faculties, the subjects for the academical prizes, &c.

WE have on our table the Reports of the Mining Surveyors and Registrars for the Colony of Victoria for the quarters ending June 30, Sept. 30, and Dec. 31, 1871.

THE Report of the Chief Commissioner ot Mines for the Province of Nova Scotia for the year 1871 is printed. A report is appended of the Provincial Museum, recently established, and designed to be a permanent exhibition of the industrial resources of the province, combined with a Museum of Science and Art. The mineralogical and zoological departments appear to be well represented.

WE have received the Monthly Record for January of Results of Observations in Meteorology, Terrestrial Magnetism, &c., taken at the Melbourne Observatory, under the superintendence of Mr. R. J. Ellery.

THE American Palestine Exploration Society has, we learn from *Harper's Weekly*, lately received paper squeezes of two basaltic stones inscribed with Phœnician characters similar to, and perhaps companions of, the celebrated Moabite stone of which we have heard so much. The acquisition of the stones themselves has been a subject of much rivalry between the British and American societies; in consequence of which the Arabs, believing them to be extremely valuable, have hidden them, although it is hoped without destroying them, as was done with the Moabite stone. These squeezes were obtained by two well-known Americans, the Rev. D. Stuart Dodge and Frederick S. Winston, and have been forwarded by them to New York. Pen-and-ink copies have already been received, and have lately been lithographed and distributed among American scholars. It is not certain that the stones from which these squeezes were taken are genuine antiquities, the Orientals being unfortunately too well versed in the art of manufacturing such objects, so as to meet any demand. There is, however, a strong probability that they are what they profess to be. At any rate, they will probably before long be subjected to such an examination by experts as will determine their true character.

THE Report just issued of the Proceedings of the Geologists' Association includes detailed accounts of the visits and excursions made by the association during March and April 1871, and Messrs. R. and A. Bell's paper on "The English Crags and their Stratigraphical Divisions."

THE ninth Annual Report of the Wigan Field Naturalists' and Scientific Society contains an important paper by Mr. J. Perrins, on "The Duration of the Wigan Coalfields," illustrated by a coloured section. The Report is otherwise chiefly occupied by accounts of the different excursions of the society.

THE Bury Natural History Society has issued its first Report for the time from its foundation, in January 1868, to December 1871. Its object has been chiefly the investigation of the natural history of the district, which has been pursued with vigour; and the Report contains more or less complete lists of the flowering plants and ferns, lepidoptera, birds, mollusca, fishes, reptiles, and mammalia of the neighbourhood of Bury (the last four classes being somewhat oddly classified as the "animals" of the district).

THE "Verhandlungen der k.k. Zoologisch-botanischen Gesellchaft in Wien," for 1871, contains a number of valuable papers. Among the more important are:—Contributions to a knowledge of the Territelariæ, Thorell (or Mygalidæ), by A. Ausserer; Enumeration of the Cryptogams of Venetia, by Baron v. Hohenbühel-Heufler; Synopsis of the Fishes of the Red Sea, Part II., by Dr. C. B. Klunzinger; Monograph of the genus Certhiola, by Dr. O. Finsch; Monograph of the genus Hylæus, by Prof. Förster.

A PERIODICAL, called the *Economista di Roma*, is now published in Rome, and contains papers upon finance, agriculture, commerce, trades, public works, and statistics.

THE following reprints lie on our table, which we commend to the notice of those interested in the various subjects:—"How Fishes Breathe," by Mr. John C. Galton, from the *Popular Science Review*; "An Account of some Experiments relating to the Influence exercised by Colloids upon the Forms of Inorganic Matter," by Dr. W. B. Ord, from the "St. Thomas's Hospital Reports;" and "Non-existence of Projectile Forces in Nature," by Mr. J. A. Parker, a paper read before the American Institute.

IN a lecture on "The Influence of Human Progress on Medical Education," delivered at the Royal Victoria Hospital, Netley, Dr. W. Aitken gives an interesting sketch of the causes which have led to the improvements in the condition of medical education which have taken place especially within the last fifty years.

AN important ornithological work is announced from America as in the press, to be published by the Naturalists' Agency, Salem, Mass.—"A Key to North American Birds," by Dr. Elliott Coues, to be illustrated by seven steel plates and upwards of 250 woodcuts, and designed as a manual or text-book of the birds of North America.

WE learn from the *Garden* that Dr. Asa Gray, of Cambridge, Massachusetts, the author of "How Plants Grow," and of many important works and papers on botany, has lately brought out another little book, entitled "How Plants Behave," which deals with the climbing and other habits of plants, and is as likely to prove as valuable as the first-mentioned work.

MESSRS. W. and A. K. JOHNSTON have issued "The Edinburgh Sixpenny Quarto Atlas," a marvel of cheapness. It contains sixteen coloured maps, which, though small, are executed in the style with which we are so familiar in the productions of this house.

AS an illustration of the success which generally attends well conducted zoological gardens and aquaria, we may state that, although quite recently organised, the receipts from 216,000 visitors to the aquarium at Berlin for the year 1871 amounted to nearly 40,000 dollars.

WITH reference to the alligator story which we recently printed, Mr. W. C. Easton, who found the nest containing sixty-seven eggs on Eighteen Mile Island, Fitzroy River, on the 31st January last, informs the *Rockhampton Bulletin* that he at that time placed four eggs under a hen, and on visiting the hen's nest on March 14, found two young alligators had broken their shells, and were alive and doing well. They were then of slender form, about ten inches long. Mr. Easton, who is well acquainted with the habits of the alligator, expects his young saurians will be strong enough to bring into Rockhampton for exhibition in the course of a month or six weeks.